FTD-ID(RS)I-0667-77

①
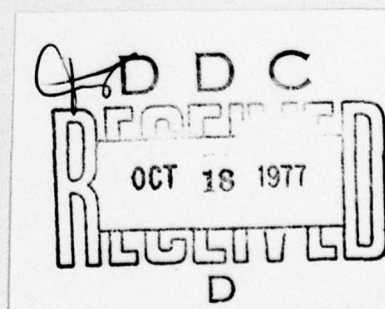
FOREIGN TECHNOLOGY DIVISION

UPDATED SYSTEM FOR CALCULATIONS OF COORDINATES
FOR LOCATING POINTS ON COMPUTER GEO 2

by

W. Gedymin

D D C
RECEIVED
OCT 18 1977
D

FTD- ID(RS)I-0667-77

EDITED TRANSLATION

FTD-ID(RS)I-0667-77   12 May 1977

FTD-77-C-000514

UPDATED SYSTEM FOR CALCULATIONS OF COORDINATES
FOR LOCATING POINTS ON COMPUTER GEO 2

By: W. Gedymin

English pages: 6

Source: Przeglad Geodezyjny, VOL 47, NR 12,
        1975, PP. 499-500.

Country of origin: Poland
Translated by: LINGUISTIC SYSTEMS, INC.
               F33657-76-D-0389
               Wieslaw Wiernicki
Requester: FTD/ETCK

FTD- ID(RS)I-0667-77   Date 12 May 19 77

M.I. Witold Gedymin
Warsaw

UPDATED SYSTEM FOR CALCULATIONS OF COORDINATES FOR LOCATING POINTS ON COMPUTER GEO 2.

In the majority of Geodesy Information Centers in the Country (Poland), the machine GEO 2 is nowadays a basic computer. This computer, relatively well programmed for Geodesy, is used for various typical calculations, and in particular to Geodetic workout of detailed plans for utilising the terrain, land survey and ensuing work. Programs enabling one to carry out this type of calculations are incorporated in two systems: system PG 4, and system MAPA 1, as well as different ver... s of them modified by the users.

System MAPA 1 was a first Geodetic computer system enabling one to perform different Geodetic problems in the conversation form. To that effect a special language was created, consisting of several specialised instructions designed to formulate and record contents of the problems being solved. Choice of instructions and their functions were closely related to designation of the system. It should be noted that used in GEO 2 form of cooperation of operator and computer has positively passed practical tests, contributing to improvement of the organization of calculation work.

System MAPA 1. designed mainly for needs of urban engineering Geodesy, was also succesfully employed in calculating works involving survey, grouping and exchange of grounds. Those uses are, amongst other things, characterized by utilization of fairly big compendiums of points. Existing limitations as to size of those compendiums in both systems mentioned above (PG 4 - 1000 points, MAPA 1 - 576 points) demanded from users additional work

on suitable organization of the calculations.

On the base of accumulated experiences CIGiK, with cooperation
of OPGK in Kielce, have designed a simplified, modified version
of system MAPA 1, intended mainly for calculations used in
ground survey. In that design were utilized, in particular,
certain experiences and conclusions resulting from work of
M.I. A. Bienkowski, Manager of calculation center in OPGK
Koszalin.

Incorporated with the idea of improvement of the organization
of calculating process, modifications in programming
have caused:
- increase in number of points placed at one time in
  memory banks of GEO 2;
- shortening of calculating time;
- improvement of quality control leading to faster
  identification of mistakes;
- lessening of efforts in data preparation.
This new version of the system retains the form of operator-
computer cooperation, realized with help of eleven chosen
instructions consisting of:
- heading;
- parameter sequence;
- end of instruction symbol ":" colon
Headings, describing designation of instructions are decimal
figures of a division (1,11) ending with a sign "." (full stop)

Parameters are quantity and numbers of ptints.

Figures are: linear sizes (coordinates, lengths measured,
running (current) measures and aftermeasures) and angle measu-
res recorded in decimal system according to principles
of code W-GEO

Two methods of presenting point numbers were used.

First method(as in system MAPA 1) allows use of numbers

as letters-figures. Such number begins with a letter N, after which follows one letter of international telecode No. 2, and then decimal number of a division (1, 9999 9999). End of name is indicated with a symbol "." (full stop).

Second method is based on the use of figures only shown as decimal numbers ending with a full stop. The numbers are adopting succesive values from the divisions determined by the user (NP_{min}, NP_{max})
where:

   NP_{min} - lowest, used in a given compendium of points;
   NP_{max} - highest point number.

Programming, including required work positions, occupies 1022 words of GEO 2 memory bank. Remaining capacity of memory bank (2050 words) is divided into three fields (A, B, I), designated suitably for memorizing:
   - coordinates x, y points with numbers shown as decimals;
   - letter-figure point numbers and their coordinates x, y,
   - parameters of successively realised instructions.

Parameters memorized in field "I" are placed in successive memory words, and each parameter occupies one word.

Identical recording method is used in field "B" where each point occupies three words (number, x, y).

Different methods in utilizing memory banks are used for memorizing coordinates x, y in field "A". In this field are recorded only coordinates x of points y, and each pair of coordinates is placed in two pseudowords with determined number of bits.

Those pseudowords are placed in field "A" successively one after another, disregarding division of that field into successive machine words (34 bits).

This causes that, on occasions, single coordinates show in two, next to each other, machine words.

Number of bits in pseudowords is determined by the user depending on number of decimal figures in coordinates. In order to minimise number of figures, coordinates x, y are reduced to point "O" of the area subjected to calculations. Coordinates of such point "O" are determined on the basis of following, taking into consideration methods for presentation of numbers in computer GEO 2, patterns:

$$x_o = \frac{2x_{min} + x_{max}}{3} \; ; \qquad y_o = \frac{2y_{min} + y_{max}}{3}$$

where:

(x_{min}, x_{max}) and (y_{min}, y_{max}) – limits of division of changeability for x and y in area subjected to calculation.

Table

w	$x_{max} - x_{min}$ $y_{max} - y_{min}$
1	2,621.43 m.
2	167,722.15 m

In the methods described are determined two basic sizes of the area. Their choice depends on difference x_{max}, $- x_{min}$ and y_{max}, $- y_{min}$. Table above gives those sizes with corresponding parameter of area size "w" being chosen by the user.

Location of coordinates x, y of random point in field "A" depends on its number. Calculations of the address (A_i) of the machine word in which is recorded the first part of the pair of coordinates x_i, of point y_i with number NP_i is done as per formula:

$$A_i = A_A + \text{entier}\left(\frac{(NP_i - NP_{min.})(15w + 21)}{34}\right)$$

where:

A_A - address of the beginning of field A;

w - parameter of the size of area (1 or 2)

Maximum amount of par coordinates (n) placed at one time in field "A" can be defined with a formula:

$$n = NP_{max} - NP_{min} = \text{entier} \left(\frac{(2049 - 3p - i) \cdot 34}{15w + 21} \right)$$

where:

p - maximum amount of points placed in field "B"

i - maximum amount of parameters recorded in field "I"

Methods used in utilizing memory caused clearly an increase in number of memorised par coordinates of points at one time. Assuming p=o, and i=50, and w=1 that number equals 1888, three times more than in system MAPA 1 and almost twice as much as in system PG 4.

Described programming was limited to 11 most often used organizational and geodetic instructions. Their detailed description was given in printed documentation of programming.

Increased capacity of the system for quality control enabled quicker identification of reasons for mistakes. Placement of area category in general data allowed automatically for definition of tolerances for certain instructions and their consideration in eliminating mistakes and determining calculating process.

Mistakes in data preparation are indicated by printing of suitable comments. This way of signalisation allows for continuation of calculations eliminating "in process interventions by the operator. It influences speeding up of calculation process.

Speeding up of program was also achieved thru time optimization of programs and abandonment of printing points coordinates calculated as result of single instruction.

Lessening the amount of work needed in data preparation
was achieved thru:
- Use of figure headings for instructions;
- Introduction of two ways of presentation of point numbers;
- Single insertion in general data of parameters defining ground category, instead of looking up in the instructions for tolerances and their proportions;
- Simplification in recording of number sequence (in instructions for field calculations and printing points list), varying from each other by values of +1 or -1, by inserting limiting numbers for such sequence.

Described programming was as of February 1975 used in practice in OPGK Kielce (town), and OPGK Lublin (town), on works related to calculations of the relation of surfaces of already existing lots to newly created lots and vice-versa, as well as in calculating work for ground survey.

As appears from the initial evaluation of the results of system adaptation, and taking into consideration all new characteristics of programming, approximately double calculating capacity in comparison with systems MAPA 1 and PG 4 was achieved.

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER FTD-ID(RS)I-0667-77	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* UPDATED SYSTEM FOR CALCULATIONS OF COORDINATES FOR LOCATING POINTS ON COMPUTER GEO 2		5. TYPE OF REPORT & PERIOD COVERED Translation
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) W. Gedymin		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Foreign Technology Division Air Force Systems Command U. S. Air Force		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE 1975
		13. NUMBER OF PAGES 6
14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)*		15. SECURITY CLASS. *(of this report)* UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

09; 08

DD FORM 1473 EDITION OF 1 NOV 65 IS OBSOLETE

DISTRIBUTION LIST

DISTRIBUTION DIRECT TO RECIPIENT

ORGANIZATION	MICROFICHE	ORGANIZATION	MICROFICHE
A205 DMATC	1	E053 AF/INAKA	1
A210 DMAAC	2	E017 AF/RDXTR-W	1
B344 DIA/RDS-3C	8	E404 AEDC	1
C043 USAMIIA	1	E408 AFWL	1
C509 BALLISTIC RES LABS	1	E410 ADTC	1
C510 AIR MOBILITY R&D LAB/FIO	1	E413 ESD	2
C513 PICATINNY ARSENAL	1	FTD	
C535 AVIATION SYS COMD	1	CCN	1
C557 USAIIC	1	ETID	3
C591 FSTC	5	NIA/PHS	1
C619 MIA REDSTONE	1	NICD	5
D008 NISC	1		
H300 USAICE (USAREUR)	1		
P005 ERDA	1		
P055 CIA/CRS/ADD/SD	1		
NAVORDSTA (50L)	1		
NAVWPNSCEN (Code 121)	1		
NASA/KSI	1		
AFIT/LD	1		